



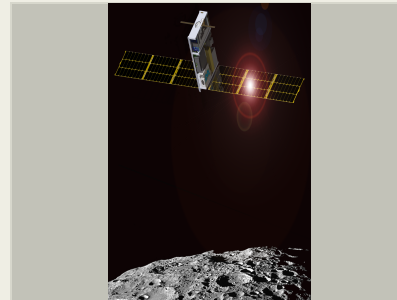
Project Introduction

Lunar IceCube is a 6U CubeSat that will be launched by SLS on Artemis 1. Its mission is to prospect for water in ice, liquid, and vapor forms and other lunar volatiles from a low-perigee, inclined lunar orbit. Morehead State University is leading the development of Lunar IceCube under a NextSTEP partnership. Lunar IceCube will use the Broadband InfraRed Compact High Resolution Exploration Spectrometer (BIRCHES), developed by Goddard Space Flight Center (GSFC). BIRCHES is a compact version of the successful New Horizons instrument designed with the high spectral resolution (5 nm) and wavelength range (1 to 4 μm) needed to distinguish forms of water, including ice. This compact, extremely sensitive spectrometer can be adapted for future small satellite missions in support of solar system exploration. Lunar IceCube will use an innovative RF Ion engine combined with a low energy trajectory to achieve lunar capture and a science orbit of 100 km perilune.

Anticipated Benefits

The Lunar IceCube mission provides several benefits to NASA, other government agencies, and the commercial space sector. These benefits fall into four categories:

- 1.) Science for future human exploration,
- 2.) Enabling technologies,
- 3.) Implementation of a ground station for deep space SmallSat missions, and
- 4.) Development of processes for SLS (and conceivably other heavy launch vehicles) to accommodate secondary payloads.



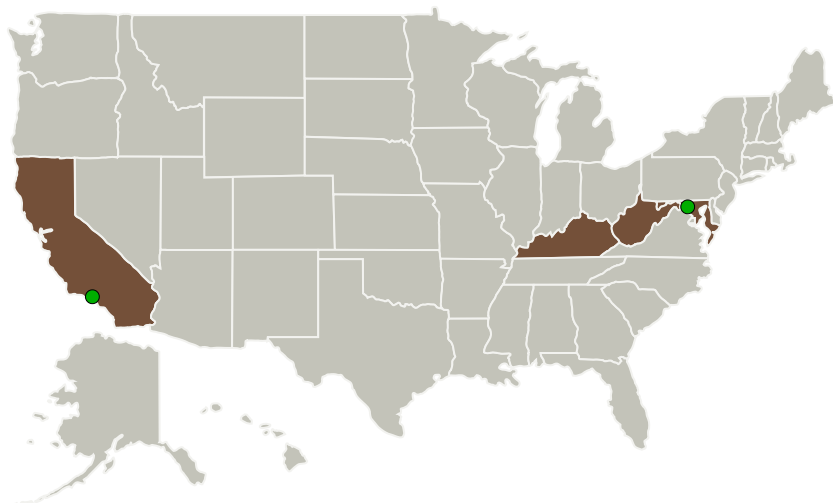
Lunar IceCube in Lunar Orbit - Artist's Conception Image
Courtesy of Morehead State University.

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Primary U.S. Work Locations and Key Partners



| Organizations Performing Work | Role | Type | Location |
|-------------------------------------|-------------------------|-------------|----------------------|
| Morehead State University | Lead Organization | Academia | Morehead, Kentucky |
| ● Goddard Space Flight Center(GSFC) | Supporting Organization | NASA Center | Greenbelt, Maryland |
| ● Jet Propulsion Laboratory(JPL) | Supporting Organization | NASA Center | Pasadena, California |

Primary U.S. Work Locations

| | |
|------------|---------------|
| California | Kentucky |
| Maryland | West Virginia |

Organizational Responsibility

Responsible Mission Directorate:

Exploration Systems Development Mission Directorate (ESDMD)

Lead Organization:

Morehead State University

Responsible Program:

Exploration Capabilities

Project Management

Program Director:

Christopher L Moore

Project Manager:

Andres Martinez

Principal Investigator:

Benjamin K Malphrus

Co-Investigator:

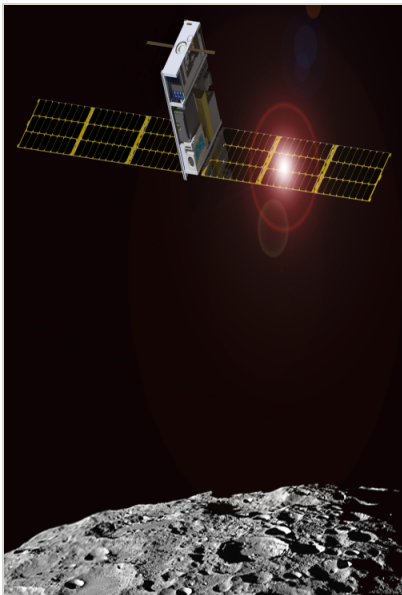
Pamela E Clark

Lunar IceCube

Active Technology Project (2015 - 2024)



Images

**Lunar IceCube**

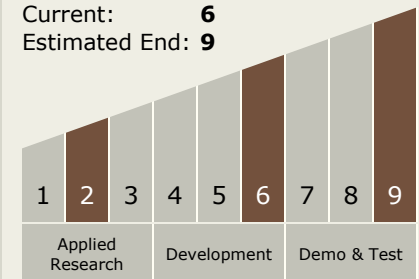
Lunar IceCube in Lunar Orbit -
Artist's Conception Image Courtesy
of Morehead State University.
(<https://techport.nasa.gov/image/143617>)

Project Website:

<https://www.nasa.gov/feature/goddard/2019/lunar-icecube-mission-to-locate-study-resources-needed-for-sustained-presence-on-moon>

Technology Maturity (TRL)

Start: 2
Current: 6
Estimated End: 9

**Technology Areas****Primary:**

- TX07 Exploration Destination Systems
 - └ TX07.1 In-Situ Resource Utilization
 - └ TX07.1.1 Destination Reconnaissance and Resource Assessment

Target Destination

The Moon

Supported Mission**Type**

Planned Mission (Pull)